Volume 087
Article 10

# IDAHO
# DEPARTMENT OF FISH AND GAME

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## A PROPOSAL FOR COMPENSATION OF KOKANEE FISHERY LOSSES AT PEND OREILLE LAKE, IDAHO

November, 1983

CONTENTS



List of Figures and Tables

SUMMARY

The kokanee (Oncorhynchus nerka) spawning run in the Clark Fork River has essentially been eliminated since Cabinet Gorge Dam was constructed in 1951. Blockage of fish to upstream spawning areas, reduced gravel recruitment to the lower reaches of the river and, to **a** lesser degree, fluctuation of post-spawning water levels downstream of the dam contributed to this impact. However, an eight-year creel census study did not demonstrate any impacts to kokanee harvest as a result of the dam. Kokanee spawning on shorelines and in other tributaries of the lake was productive enough to compensate the loss of upstream spawning areas and thereby sustain the kokanee population and harvest during those initial years.

Spot surveys of lakeshore spawning kokanee were initiated when Albeni Falls Dam was constructed in 1952. Observations in the following years revealed that lakeshore spawners gradually declined to their present, apparently insignificant, representation in the kokanee population. Between 1952 and 1968, the data demonstrate a strong negative relationship between the extent of lake level drawdown following the onset of spawning and the subsequent catch of kokanee.

Mitigation agreed to in 1957 was intended to redress unforeseen kokanee impacts resulting from the dams.

Operations at Albeni Falls Dam have also been changed since 1968 to mitigate the impact of drawdown by securing lakeshore spawning areas throughout the kokanee spawning season. A rebounding of the lakeshore spawning kokanee population has not occurred, however. Examination of long-term kokanee harvest data indicates stock-recruitment was insufficient due apparently to the earlier, gradual depletion of lakeshore spawning kokanee stocks.

The kokanee population in Lake Pend Oreille was further impacted by the establishment of opossum shrimp (Mysis relicta) in the lake in the late 1960's and early 1970's. The shrimn effectively reduce the survival of naturally-spawned kokanee fry, thereby complicating the recovery of kokanee to a self-sustaining population.

We conclude that all parties should be involved in the restoration of kokanee populations. It is considered possible to reestablish some kokanee use of shoreline spawning areas, recognizing that kokanee recruitment from such efforts would be limited by mysis-related factors and degradation of spawning gravel quality.

Recent research demonstrates that releasing hatchery-reared kokanee fry in mid-summer coincides with the availability of key food organisms. These hatchery fry have enhanced survival compared to naturally-produced fry whose survival is inhibited due to the temporal displacement of key food organisms by mysis shrimp.

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The delayed-release concept is proposed as a means of overcoming the mysis-related impacts. Participation by the parties toward development of suitable hatchery facilities would also serve to compensate the rea:aining hydroelectric-related impacts to kokanee populations in Lake Pend Oreille.

# INTRODUCTION

The Columbia River Basin Fish and Wildlife Program of the Northwest Power Planning Council provides that upon approval by the Council, Bonneville Power Administration "...shall fund an evaluation of the degree to which the Albeni Falls and Cabinet Gorge projects are responsible for the decline of the Lake Pend Oreille fishery, and the level of mitigation necessary to restore a reasonable number of fish in Lake Pend Oreille." The program further provides that (upon approval by the Council) "...Bonneville shall fund the design, construction, operation, and maintenance of a hatchery on the Clark Fork River to achieve the level of fish restoration defined (above)." (Northwest Power Planning Council 1982)

Large amounts of data and documented observations have been gathered for the Lake Pend Oreille kokanee fishery over the past 30 years. Available information has been reviewed and analyzed. Experimental data are also available that allows a description of a mechanism for restoring a reasonable number of kokanee in Lake Pend Oreille without the additional cost of further evaluation studies. This report describes the likely impacts of the Albeni Falls and Cabinet Gorge projects and other non-hydropower factors on the Lake Pend Oreille kokanee fishery and proposes the level and means of restoring a reasonable number of kokanee in Lake Pend Oreille.

2. Fluctuation of water level below the dam during and after spawning; and

3. Blockage of suitable spawning gravel recruitment from upstream sources to the lower river areas.

construction and, to a lesser degree, operation of Cabinet Gorge Dam essentially eliminated nearly all of the kokanee production capability in the only major tributary to Lake Pend Oreille.

In contrast to impacts related to Cabinet Gorge Dam, operations at Albeni Falls Dam, as opposed to construction, were the primary factor of consequence which impacted kokanee. Release of seasonally-stored waters during the 1952-1967 period often overlapped the onset of kokanee spawning. Dewatered redds were commonly observed and mortality of incubating embryos was believed to be heavy, though never adequately quantified. On Priest Lake Rieman et al. (1980) showed by simulation analysis that a winter drawdown similar to that maintained on Pend Oreille could have resulted in elimination of 90% of incubating embryos. The success of kokanee lakeshore spawning efforts was, in large part, dependent upon the degree of the drawdown. This effect is substantiated by analysis of the data which indicate a highly significant ($a$ = .005 with 13 degrees of freedom) negative relationship (r = -0.71) between the degree of post-November 15 drawdown and the harvest of kokanee five years later (Fig. 1).

Degradation of shoreline spawning gravels may also have played a role in declining reproductive success. Gibson ($1973_b$) and Hassemer (in preparation) note that shoreline gravel is typically of marginal quality for spawning. A large percentage of fines exists in the gravel that may restrict intragravel flow for the eggs. In shoreline spawning areas only the upper beach is usually adequately cleaned by wave action. In Priest Lake this zone was typically in the upper 3' to 6' (Rieman et al. 1980). The altered drawdown regime on Pend Oreille results in the elimination of upper beach areas that have been cleaned by wave action prior to spawning. Over a period of years this may have resulted in an increasing deposition of fine materials in gravels used for spawning and could have been at least partially responsible for population declines.

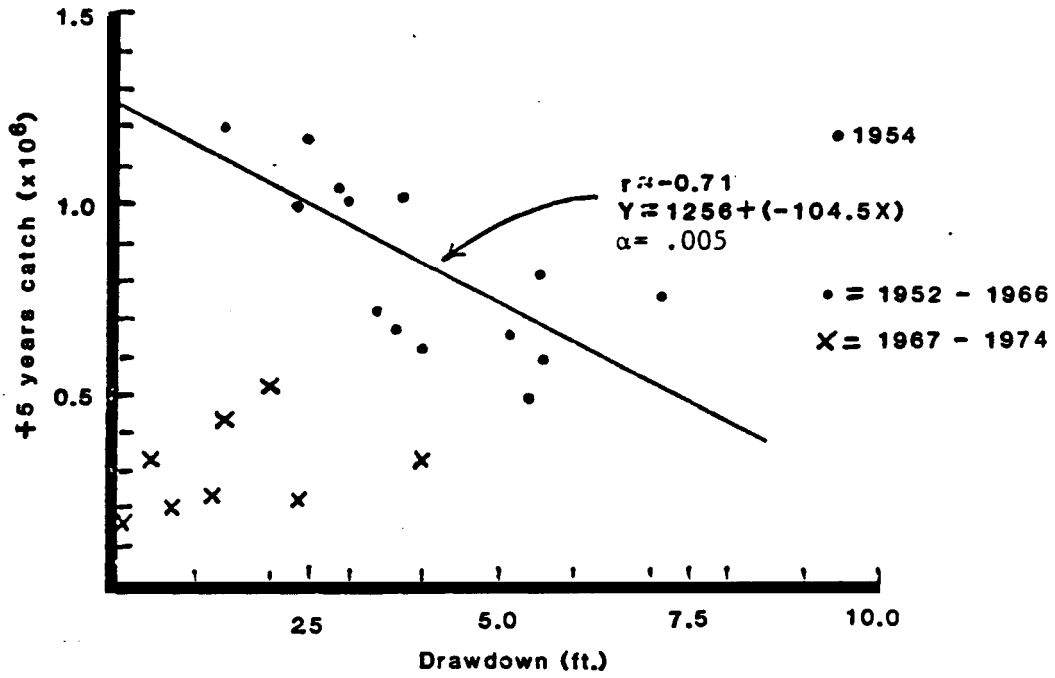


Figure 1. Relationship between Lake Pend Oreille drawdown after 15 November and harvest of kokanee five years later; r value computed for years 1952 to 1966. Point for 1954 excluded from calculations because drawdown procedure was abnormal, i.e., in spring rather than in fall.

Table 1. Estimated minimum of kokanee by license class, Pend Oreille Lake, Idaho, 1951-198[0] (Ellis and Bowler 1981).

| Year | Total | Resident | Nonresident | Commercial |
|---|---|---|---|---|
| 1951 | 820,486 | | | 170,500 |
| 1952 | 514,913 | 183,657 | 268,116 | 63,140 |
| 1953 | 1,335,881 | 412,288 | 382,593 | 541,000 |
| 1954 | -1,232,916 | 326,568 | 362,844 | 543,504 |
| 1955 | 650,375 | 181,492 | 228,610 | 240,273 |
| 1956 | 1,092,651 | 423,092 | 240,294 | 429,265 |
| 1957 | 751,113 | 256,280 | 277,699 | 217,134 |
| 1958 | 1,197,426 | 365,082 | 359,132 | 473,212 |
| 1959 | 1,161,913 | 377,065 | 332,001 | 452,847 |
| 1960 | 1,039,200 | 320,041 | 278,571. | 440,588 |
| 1961 | 991,955 | 257,362 | 305,361 | 429,232 |
| 1962 | 650,960 | 168,847 | 190,039 | 292,074 |
| 1963 | 1,049,339 | 359,677 | 314,291 | 375,371 |
| 1964 | 1,162,625 | 357,152 | 452,962 | 352,511 |
| 1965 | 1,007,292 | 385,007 | 319,034 | 303,251 |
| 1966 | 808,744 | 220,317 | 351,403 | 237,024 |
| 1967 | 710,312 | 218,629 | 290,081 | 201,602 |
| 1968 | 618,405 | 207,058 | 288,454 | 122,893 |
| 1969 | 483,292 | 180,294 | 242,109 | 60,889 |
| 1970 | 654,848 | 173,672 | 367,981 | 113,195 |
| 1971 | 590,058 | 189,377 | 242,383 | 158,298 |
| 1972 | 521,048 | 172,952 | 186,499 | 161,597 |
| 1973 | 328,739 | 127,291 | 195,767 | 5,681 |
| 1974 | 319,286 | 132,981 | 186,305 | -- |
| 1975 | 438,382 | 208,347 | 230,035 | -- |
| 1976 | 218,639 | 67,932 | 150,707 | -- |
| 1977 | 233,548 | 72,616 | 165,932 | -- |
| 1978 | 167,640 | 62 ,100 | 105,540 | -- |
| 1979 | 198,844 | 78,343 | 120,501 | -- |
| 1980 | 184,139 | 75,002 | 109,137 | -- |

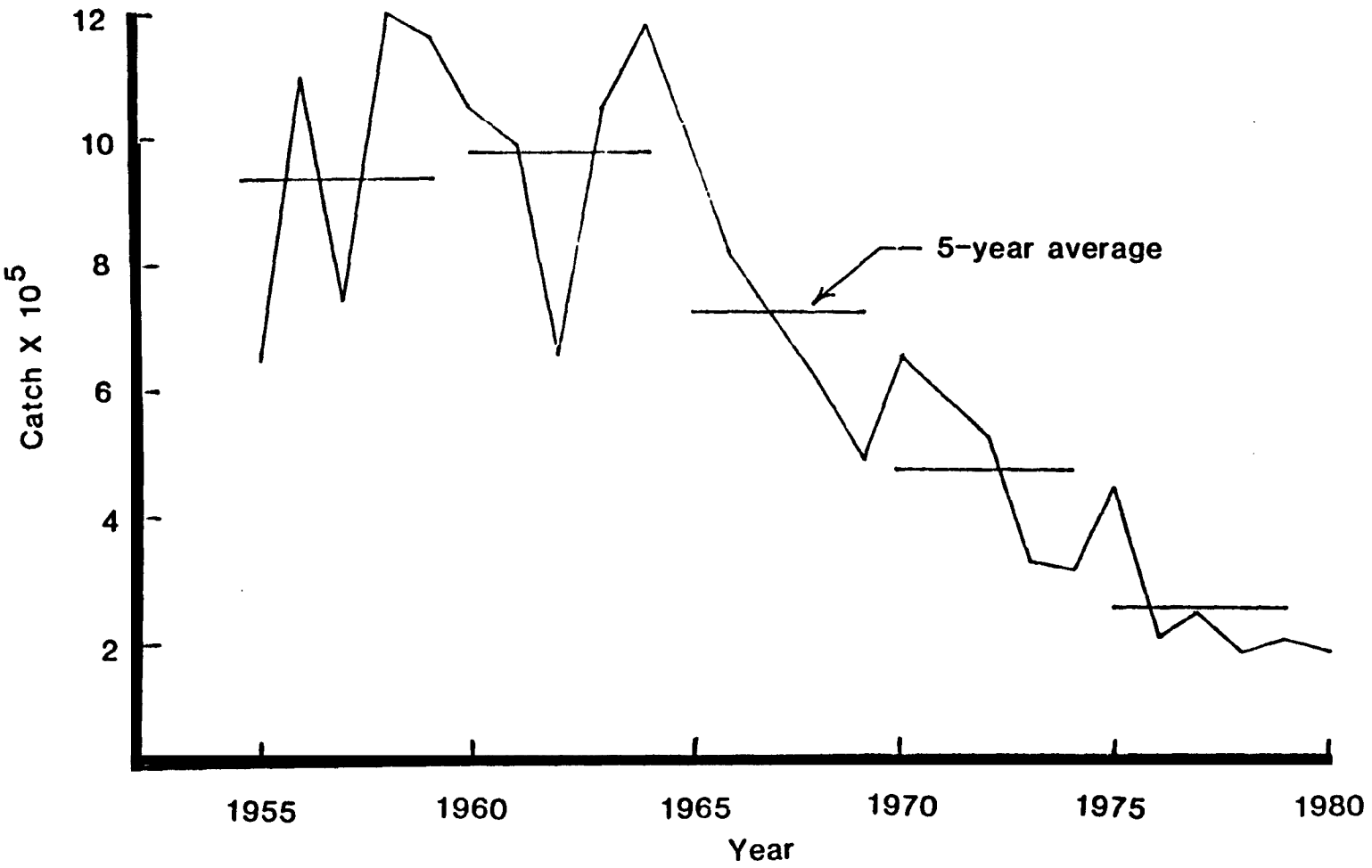


Figure 2. Yearly and five-year average of kokanee harvests at Lake Pend Oreille, 1955 to 1980 (Ellis and Bowler 1981).

Table 2. Five-year average catch/effort for Lake Pend Oreille kokanee sport fishery, 1952-1980 (Ellis and Bowler 1981).

| Years | Effort (hours fished) | Catch | C/E |
|---|---|---|---|
| 1952-56 | 374,472 | 601,911 | 1.61 |
| 1957-61 | 338,048 | 625,719 | 1.85 |
| 1962-66 | 278,189 | 623,746 | 2.24 |
| 1967-71 | 230,664 | 480,008 | 2.08 |
| 1972-76 | 229,655 | 331,763 | 1.44 |
| 1977-80[a] | 239,824 | 197,293 | 0.82 |

[a] Four-year period.

## RELATIONSHIP OF HARVEST TO FISHERY

We inspected the relationship of catch in a given year to the catch five years following (Fig. 3). A five-year age for spawning kokanee at Lake Pend Oreille was most common in the 1950's and 1960's, although four-year spawners were also important. As shoreline spawners were lost, the proportion of five-year spawners became less. The relationship may be viewed as a stock-recruitment relationship, i.e., a large catch represented a large population, which begat another large population and catch five years later.

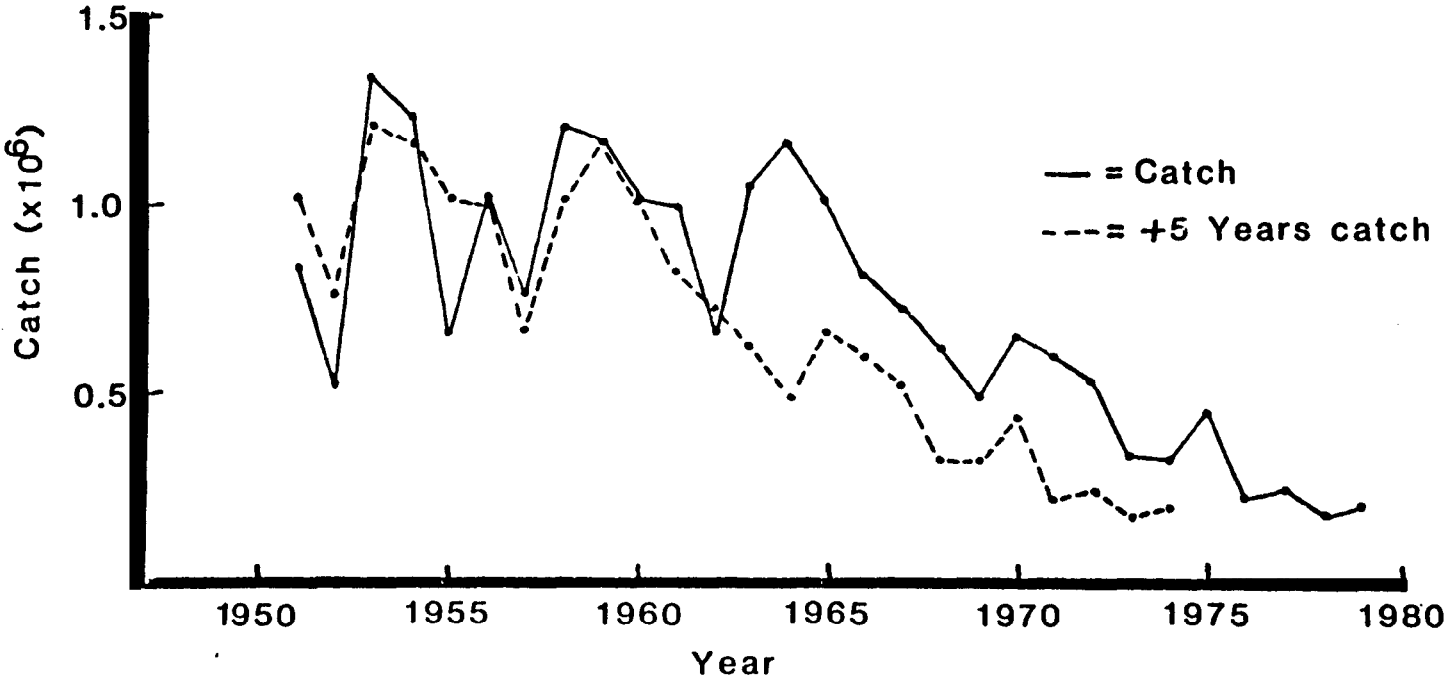


Figure 3. Relationship of kokanee harvest and the harvest five years later at Lake Pend Oreille, 1951 to 1979 (Ellis and Bowler 1981).

## RELATIONSHIP OF LAKE DRAWDOWN TO FISHERY

Before impoundment by Albeni Falls Dam, spawning of kokanee in Lake Pend Oreille occurred when the lake was near its annual minimum level of 2,046 to 2,049 feet m.s.l. Observed spawning was above the 2,040 foot level. Drying or freezing of nests due to declining water level rarely occurred (Jeppson 1960). Albeni Falls Dam provided the capability to reduce the water level after kokanee had spawned along the lakeshore.

To determine whether drawdown of the water level by regulation at Albeni Falls Dam during or following the kokanee spawning period was a factor in the declining kokanee population, we inspected the relationship of drawdown in a given year to the catch five years later.

November 15 was selected as the date by which kokanee spawning was underway (Jeppson 1954, 1960). The relationship indicated that catches five years following any given spawning year were negatively related to the amount of drawdown. This relationship was apparent through the mid-1960's (Fig. 4). After 1966, the data show no relationship between drawdown and harvest, indicating that shallow-depth lakeshore spawners were no longer strongly represented in the population. In 1968 the Corps initiated a compromise water drawdown schedule that reduced impacts on shoreline spawning returns to a minimum. While his schedule remains in effect, the kokanee population has yet to rebound.

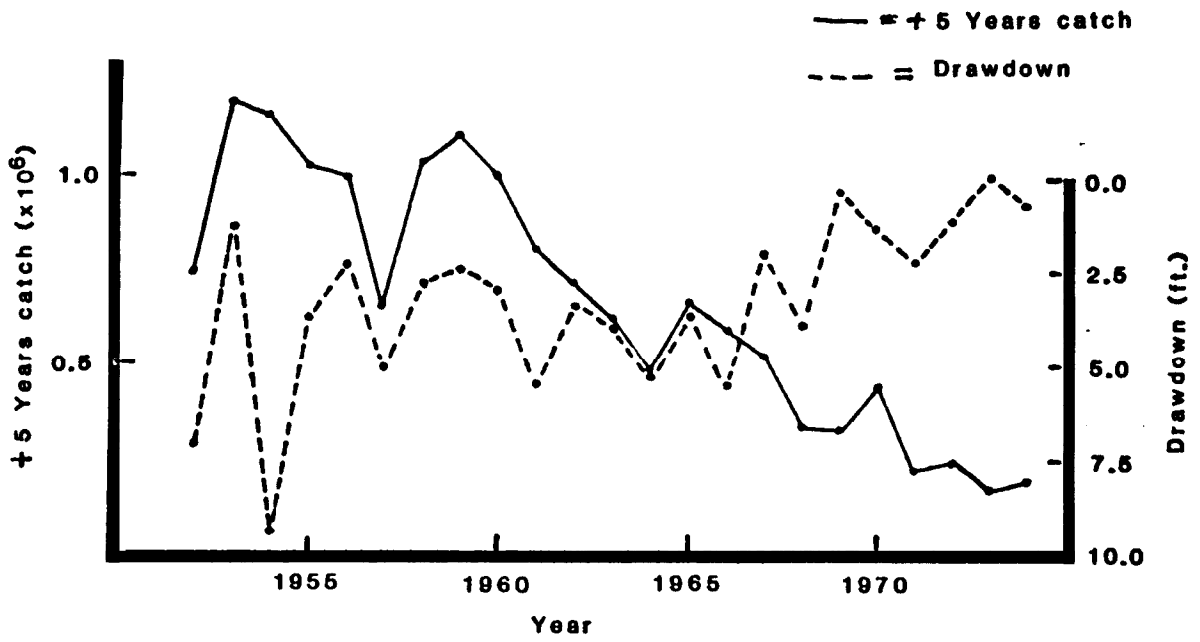


Figure 4. Lake level drawdown after 15 November and kokanee catch five years later at Lake Pend Oreille, 1952 to 1974 (Ellis and Bowler 1981).

# IMPACT OF OPOSSUM SHRIMP ON KOKANEE

The opossum shrimp, Mysis relicta, was introduced to Pend Oreille Lake in an effort to enhance the forage base for kokanee. Idaho and most other western states engaged in large-scale introduction of M. relicta in the mid-1960's. Much of the interest in these introductions followed the establishment of mysids in Kootenay Lake, British Columbia, which resulted in a dramatic increase in kokanee growth. In Idaho, introductions of 50,000 to 300,000 mysids from Waterton Lake, Alberta and Kootenay Lake, British Columbia, were made in Pend Oreille Lake each year from 1966 through 1970. Numbers stocked by year were: 1966, 50,000; 1967, 210,000; 1968, 300,000; 1969, 300,000; and 1970, 200,000 (Bowler 1982).

Trawl sampling failed to yield any mysids until 1972. Mysids were first collected in samples in 1972, indicating that a self-sustaining population had become established. The population remained at a low level during 1973 and 1974, but expanded rapidly in 1975 and 1976. The mysid population apparently stabilized at relatively high densities in following years (Rieman and Falter 1981).

Data collected in the late 1970's and early 1980's indicate the establishwent of mysids apparently has had a direct impact on the macro-zooplankton community of Lake Pend Oreille. A shift in temporal distribution of the cladocerans and a change in species composition of Daphnia was first observed in 1975. The change was associated with the dramatic increase in abundance of mysids that occurred that year (Rieman 1976, Rieman and Falter 1981). The changes in the macro-zooplankton community appear to be permanent, with stabilization of the mysid population at high densities.

The changes in the macro-zooplankton community likely represent a net reduction in food available for juvenile kokanee during a critical period of emergence and first feeding (Rieman and Bowler 1980). The data indicate that the change in food availability had a major negative influence on survival of juvenile kokanee beginning in 1974. Estimates of total kokanee in Pend Oreille have declined from approximately 12 million fish in 1974 to 5 million at present. Recent estimates indicate egg-to-fry survival has been substantially reduced from the survival rates which previously maintained the population. The first effects of mysis-related impacts upon kokanee would be reflected in the harvest of 1977. Much of the decline in the total kokanee population since 1974 can be attributed to the establishment of mysids (Rieman and Bowler 1980).

Cabinet Gorge Dam, Albeni Falls Dam, fishery harvest and the establishment of opossum shrimp have all been reviewed in the preceeding material in order to provide the basis for identification of the role of each in the decline of Lake Pend Oreille kokanee.

It is clear that Cabinet Gorge Dam virtually eliminated the Clark Fork River spawning population and, therefore, a major impact on harvest was expected to appear in about 1955. Although no impact on harvest appeared in 1955, the dam precluded spawning which would have otherwise compensated declines in lakeshore spawners and helped to sustain the kokanee population.

The operation of Albeni Falls Dam caused a less sudden affect that was related to the magnitude of drawdown. Small drawdowns had minor influence on the stock while large drawdowns had more influence. Over time, lakeshore spawning stocks of kokanee had depleted to levels insufficient to sustain the population.

Stabilization of lake levels since 1968 has secured present lakeshore spawning habitat, but re-exploitation of this habitat by kokanee was apparently constrained by the earlier depletion of shoreline spawning stocks and degradation of remaining habitat. Supplementation of those stocks would have been necessary to facilitate reestablishment of self-sustaining kokanee populations.

The establishment of mysids has further complicated such a recovery by effectively limiting the success of natural reproduction.

## PAST COMPENSATORY EFFORTS .

Since the construction of Cabinet Gorge and Albeni Falls dams, the Seattle District Corps of Engineers, The Washington Water Power Company (WWPC), the U.S. Fish and Wildlife Service, and the Idaho Department of Fish and Game have all taken roles of responsibility in the management of the Lake Pend Oreille fishery. Detailed listings of the involvements of WWPC and the Corps of Engineers are contained in the Appendix.

The U.S. Fish and Wildlife Service participated in data gathering in the earlier years and has administered Federal Aid in Fish Restoration (Dingell-Johnson) funds to the state for data gathering and investigations. State fish and game license funds have been used to monitor the fishery in several years and to match (25) Dingell-Johnson funds.

Early compensatory efforts by the Corps and WPC were intended to be final and inter-agency agreements and contracts to that effect were executed. Nevertheless, as time passed and new resource information was developed, the Corps and W'PC continued efforts to minimize resource impacts of their projects.

In retrospect, it appears that the efforts to identify and perform final compensation (mainly spawning enhancement and hatchery facilities) for impacts were disadvantaged by a lack of full information on long-term stock recruitment and fishery relationships as described in previous sections.

The establishment of opossum shrimp resulted in a temporal reduction of food organisms (Daphnia spp. and Bosmina sp.) important for juvenile kokanee during their first stage of feeding (Rieman 1976, Rieman and Falter 1981, Rieman and Bowler 1980, Bowler 1982). This would reduce the effectiveness of any enhancement techniques that would provide early-stage fry to the lake, such **as** developing new lakeshore or tributary spawning runs. Following four years of limnological investigations, Rieman (1977, 1978) proposed a delayed (mid-summer compared to late spring) release of hatchery-reared kokanee fry which would be timed to the availability of key food organisms. An experimental program of delayed release was initiated in 1977 and continues to the present. Evaluation has been done by sampling marked hatchery-reared fish with a trawl net (Bowler 1982) and by counting returning adults at the release site. The estimated benefit of the delayed release program, when compared to existing natural reproduction, was calculated at fourfold to twentyfold for egg-to-fall fry and egg-to-spawning adult, respectively. The discrepancy of the two calculations was probably due to underestimating hatchery fry in the fall population sampling (Bowler 1981, 1982; Rieman 1981).

Spawning runs to Sullivan Springs have increased as a result of the mid-summer release program. Run sizes at a weir above the mouth of Sullivan Springs ranged from 10,000 to 17,000 when juvenile fish were released in the spring, then increased as adult fish returned from delayed summer releases to 48,000 in 1980, 138,000 in 1981, and 116,000 in 1982 (Table 3) (Bowler 1982, Cochnauer 1983).

Table 3. Results of spring versus summer kokanee hatchery fry releases at Sullivan Springs 1975-1978 (Cochnauer 1983).

| Year | Releases | Percent Return |
|---|---|---|
| 1975 | 629,200 spring | 2.6[1] |
| 1977 | 757,700 summer | 12.9 |
| 1978 | 1,578,800 summer | 10.3 |

[1] Includes wild fish

## PROPOSED ENHANCEMENT ACTION

It is proposed that kokanee restoration to a reasonable level be performed through use of the mid-summer or delayed release concept with hatchery-reared fish. Bowler (1981) developed a theoretical model for kokanee enhancement that indicates 20 million delayed-release hatchery fry could provide a harvest of 740,000 kokanee (Fig. 5). A yearly harvest of 740,000 would be the median level of annual harvest during the years 1951-1980 and is considered to be a reasonable level of restoration.

Recent and expected spawning escapements to Granite Creek are large enough to provide the necessary number of eggs for the proposed hatchery program (Bowler 1981).

Existing Idaho Department of Fish and Game hatchery space cannot accommodate the required production. A reconnaissance of potential new hatchery sites for kokanee on Pend Oreille disclosed a promising ground-water source on WPC property on the south bank of the Clark Fork River between Clark Fork and Cabinet Gorge Dam. WPC has offered the property for a hatchery at long-term, no-cost, or low-cost lease (letter from Fred A. Shiosaki to Monte Richards, 18 March 1983, Appendix). The estimated 1983 cost of design and construction is $1,600,000 to $2,000,000[1]. Annual costs for operation and maintenance are estimated at $150,000. A time-flow construction schedule is included as Appendix 3.

[1] Idaho Department of Fish and Game, intra-department memo, Chief, Bureau of Engineering to Chief, Bureau of Fisheries, 10 October 1983.

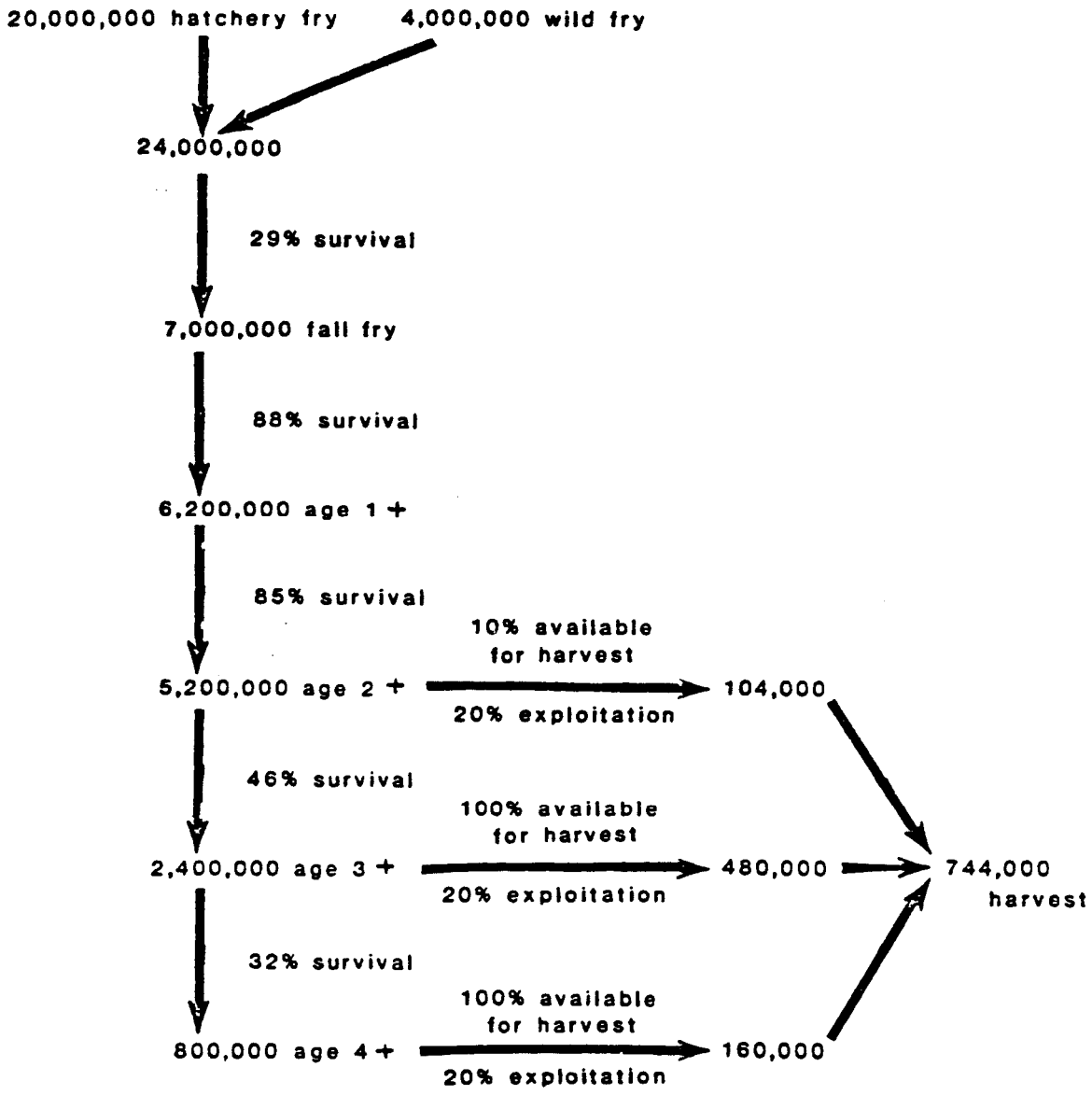


Figure 5. Kokanee population model for Pend Oreille Lake (adapted from Bowler, 1981).

## COORDINATION AND PROPOSED FURTHER ACTION

W4,'PC, CE and BPA have reviewed the data in this report and are in agreement with IDFG that data available does not lend itself to establishing degree of impact on the fishery by hydropower and nonhydropower factors. In most instances impacts can be compared only indirectly by measuring the harvest rather than impacts on the fish population. This introduces possible unrelated variables to the analysis such as the effects of disease, predation, water quality, management, climatic factors, fishing techniques and efficiency and the like.

It can be documented that adverse impacts have occurred on the kokanee population from the construction of Cabinet Gorge Dam, water fluctuations from operation of Albeni Falls Dam and from the introduction of Mysis. Due to sequential and synergistic factors, however, the relative degree of these impacts cannot be determined.

The parties are presently discussing the proposed solution and degree of involvement by each in the restoration activities. Negotiations are underway on a plan where WLT C and BPA would share construction costs of the proposed hatchery and IDFG would fund operation and maintenance costs. Although well under way, these negotiations cannot proceed to final stages without Council approval of the approach toward resolution of the issues presented herein. Upon Council approval of this report as adequately fulfilling requirements pursuant to 804(e)(4) of the Fish and Wildlife Program and approval of the recommended means of fulfilling Program Measure 804(e)(5), the parties can finalize their negotiations toward implementation of 804(e)(5).

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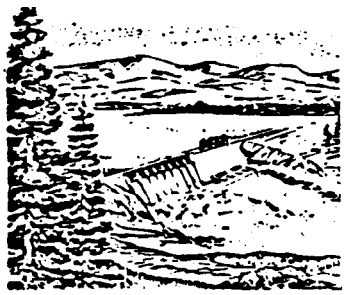
APPENDIXES

WWP 311a REV 8-73

APPENDIX 1



# THE WASHINGTON WATER POWER COMPANY

*Electric and Natural Gas Service*

P.O. BOX 3727 • SPOKANE, WASHINGTON 99220 • (509) 489-0500

FRED A. SHIOSAKI
MANAGER
ENVIRONMENTAL AFFAIRS

March 18, 1983

Mr. Monte Richards, Chief
Bureau of Fisheries
Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, ID 83707

Dear Monte:

Pursuant to our meeting of 16 February 1983 and your subsequent letter of inquiry dated 24 February 1983, my staff has reviewed the Company's records concerning fisheries mitigation measures at the Cabinet Gorge Hydroelectric Project. The enclosed chronology summarizes key events and projects pertaining to the Company's involvement in Lake Pend Oreille fisheries activities. Costs incurred by the Company for these measures have been identified wherever such information was readily available.

As you noted in your letter, the Company has also employed student biologists (since 1962) to work under the direct supervision of resource agencies. Most of the students have worked with IDFG on north Idaho fishery studies pertinent to Company hydroelectric project waters and/or operations. Time of employment has ranged from three to seven months each year. The cost of the program since its inception has been estimated at $105,000 including salary and insurance benefits, overhead, and transportation expenses. The program has been valuable in terms of educational opportunity, employment experience, enhanced IDFG labor force, and the additional resource information gained.

I trust the enclosed information will prove useful. My staff and I will look forward to reviewing the draft report prior to its submittal to the Northwest Power Planning Council or the Bonneville Power Administration. Please do not hesitate to contact us if we may be of any further assistance.

Sincerely,

Fred A. Shiosaki
Manager Environmental Affairs

RW:wpc

Enclosure

CHRONOLOGY OF MITIGATION AND OTHER FISHERY PROJECTS IN IDAHO
RELATED TO THE CABINET GORGE HYDROELECTRIC PROJECT

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| January 9, 1951 | License Number 2058 is issued by the Federal Energy Regulatory Commission. |
| Spring, 1951 | An 8-year creel census commenced to identify fishery impacts related to the Cabinet Gorge Project. The Company cooperated in this effort with technical assistance and full financial support. |
| December, 1955 | The Lake Pend Oreille Technical Committee was established. The committee was comprised of representatives from the U.S. Army Corps of Engineers, The Washington Water Power Company, the U.S. Fish and Wildlife Service and the Idaho Department of Fish and Game. |
| February, 1957 | The Technical Committee rendered recommendations concerning fishery impacts from hydroelectric projects in the vicinity of the lake. The committee recommended steps should be taken to offset possible cumulative losses of kokanee which were not reflected in the creel census data. As a result of measured dolly varden trout decline and to insure against future kokanee declines, the committee also recommended that several spawning enhancement activities be implemented. These measures included stream improvements in Spring Creek, Granite Creek, Sullivan Springs Creek, and South Gold Creek. Development of a spawning channel at the Clark Fork hatchery was also recommended as was provision of an incubation and hatchery battery with a capacity of one million kokanee egg. |

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|---|---|
| July 5, 1957 | An agreement between the Company and the Idaho Department of Fish and Game was signed which set forth the measures which would "prevent possible future damage to the fishery in and around Lake Pend Oreille".<br><br>Under the terms of the agreement, the measures to be developed and maintained by the state were the same as those recommended by the Technical Committee. These measures were contemplated to fully offset any impact to kokanee or trout which may have occurred from the existence and operation of the project.<br><br>The Company agreed to pay the State of Idaho $51,300[1/] as its share of the cost of mitigation measures (a similar agreement was struck with the U.S. Corps of Engineers). The payment included the costs of capital construction as well as operation and maintenance of the measures for the first five years.<br><br>Recognizing that the creel census study would not be complete until 1959, the agreement also provided for a technical review to analyze the final study results. |
| January 1, 1960 | Final date to complete revisions to or otherwise supplement the 1957 agreement as based on subsequent technical review of the final results of the eight-year creel census. |

1/ Dollar values for the year in which the expense was incurred. Present-day costs for, or the benefits accrued since implementation of, these measures are not reflected in the dollar figures.

| | |
|---|---|
| August, 1960 | Apparently as a result of technical review and subsequent concerns for dolly varden, the Company financed, constructed and continues to maintain an in-river spawning area designed especially for dolly warden trout. The first phase of this development (an area 25 feet by 225 feet) was developed at a cost of $4,524[1]/. Dolly varden were observed spawning in the area shortly after its completion. |
| August, 1961 | Because of first year successes at the in-river spawning area, the Company decided to expand the area by another 600 feet. The cost of this endeavor was $4,188[1]/. |
| 1962 | The Company agreed upon a final plan for mitigation which included deferral of costs to obtain and plant 200,000 dolly varden eggs over a four-year period at the Company's in-river spawning area. Additionally, the Company agreed to conduct an evaluation of the spawning area's success.<br><br>Both the Company and the Idaho Department of Fish and Game experienced difficulties in obtaining sufficient numbers of dolly varden eggs. However, the Department was able to develop a brood stock of dolly varden as a source of eggs instead. The Company funded a graduate student through the University of Idaho at Moscow to conduct an evaluation of the productivity of the spawning area; the results of the evaluation were favorable. |
| 1968 | The Lake Pend Oreille Technical Committee was reconvened to evaluate a concern for the kokanee populations of the lake. |

1970 A specific study of kamloops trout utilization of Lightning Creek was conducted by a student biologist for the Company.

1973 The Lake Pend Oreille Technical Committee recommended that the Company "initiate a study to evaluate various discharge levels from Cabinet Gorge Dam to determine the effect, if any, the establishment of a minimum flow would have on the productivity of the Pend Oreille fishery."

The study was jointly designed and initiated by Company and IDFG biologists. The investigators concluded early in the study that any reasonable minimum flow would not significantly improve spawning success for kokanee. However, the Company voluntarily established a 3,000 cfs minimum flow and has maintained that minimum since 1973. The average annual cost in terms of energy foregone is about $45,000 per year.

September 4, 1974 The Idaho Department of Fish and Game requested maintenance funds for prior mitigation measures from the Company.

September 16, 1974 The Washington Water Power Company offered to take over all maintenance procedures and costs from the Idaho Department of Fish and Game.

February 11, 1975 At a meeting of the Technical Committee, IDFG decided to continue its responsibility for maintenance of measures implemented under terms of the 1957 agreement.

Fall, 1976 The Company purchased ten radio tags which were used by IDFG to study kamloops trout in Lake Pend Oreille. Cost of the tags was $800[1]/ .

| | |
|---|---|
| January, 1978 | The results of an age and growth characteristics study of Lake Pend Oreille kamloops trout conducted by a WWP biologist was published by the Idaho Department of Fish and Game. |
| March, 1981 | The possibility of a long-term, low-cost lease for a hatchery on Company properties downstream of Cabinet Gorge Dam is questioned by IDFG and affirmed by the Company. |
| Spring, 1982 | The IDFG requests and the Company grants permission to drill and test wells on the properties proposed as a hatchery site. |
| October, 1982 | The Company reaffirmed its offer of property to IDFG at long-term, no- or low-cost lease for the purpose of hatchery siting. |

15 April 1983

Planning Branch

Monte R. Richards, Chief
Bureau of Fisheries
Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, Idaho 83707

Dear Mr. Richards:

In reply to your letter of February 24, 1983, we are very interested in the report you are preparing for the Northwest Power Planning Council on your Pend Oreille Lake fish hatchery proposal and would appreciate the opportunity to review the report prior to its submittal to the council.

The payment of $50,460 to the state by the Federal Government for the facilities mentioned in your letter is correct. The payment also legally releases the Government from all future damage claims on the kokanee fishery resulting from the future operation of Albeni Falls Dam. A similar amount under a similar agreement was provided by Washington Water Power Company.

The position of the U.S. Army Corps of Engineers in regard to your hatchery proposal has been that the above mitigation, the 1968 Albeni Falls-Pend Oreille Lake drawdown modifications for kokanee spawning and our research findings regarding the Mysis shrimp fulfills any obligation the Federal Government may have in regard to the kokanee fishery and that further Federal expenditures for fishery losses cannot be justified.

Our costs for kokanee-related fisheries research were as follows:

Chemical Data Collection on Lake Pend Oreille.

Date: June 1974 - June 1976
Contractor: U.S. Geological Survey
Contract: Interagency Transfer $32,050

Limnological Study of Lake Pend Oreille.

Dates: July 26, 1976 - December 31, 1978
Contractor: Idaho Department of Fish and Game
Contract: DACW67-76-C-0079 $43,700

Lake Pend Oreille Kokanee Restoration Evaluation.

Dates: August 15, 1979 - October 17, 1981
Contractor: Idaho Department of Fish and Game
Contract: DACW67-79-C-0109 $45,175

A number of additional studies were completed; however, it would be very difficult to provide reliable cost data without considerable effort. These studies are listed below:

1. Rich, Willis H. (inclosure 1).

2. Paulik, G.J., Kokanee Production in Lake Pend Oreille, Idaho. Seattle District, Corps of Engineers, October 31, 1969, 26 pp.

3. Bonde, Thomas J.H., The Pend Oreille Lake Kokanee Fishery. Seattle District, Corps of Engineers, August 1973, 22 pp.

4. Mathews, Steven B., Analysis of the Declining Kokanee Trout Catches in Lake Pend Oreille, Idaho. Seattle District, Corps of Engineers (1974), 13 pp.

5. Petit, Anna, Preditor - Prey Relationships of Kokanee in Lake Pend Oreille. Western Interstate Commission for Higher Education, 1978, 31 pp.

A reasonable estimate of costs for the above studies would perhaps be in excess of $100,000.

Please let us know if we can be of further assistance.

Sincerely, /s/

George W. Ploudre, P.E.
Assistant Chief, Fisheries Division

Enclosure

Copy furnished w/encl:
NPDPL-ER (Mains)

Northwest Power Planning Council
700 S.W. Taylor Street Portland,
Oregon 97205

LAKE PEND OREILLE

Reports by Dr. Willis H. Rich

Rich, Willis H.

1954. The Probable Effect of Albeni Falls Dam on the Kokanee Fishery of Lake Pend Oreille, Idaho. Seattle District, Corps of Engineers, February 1954, 17 pp.

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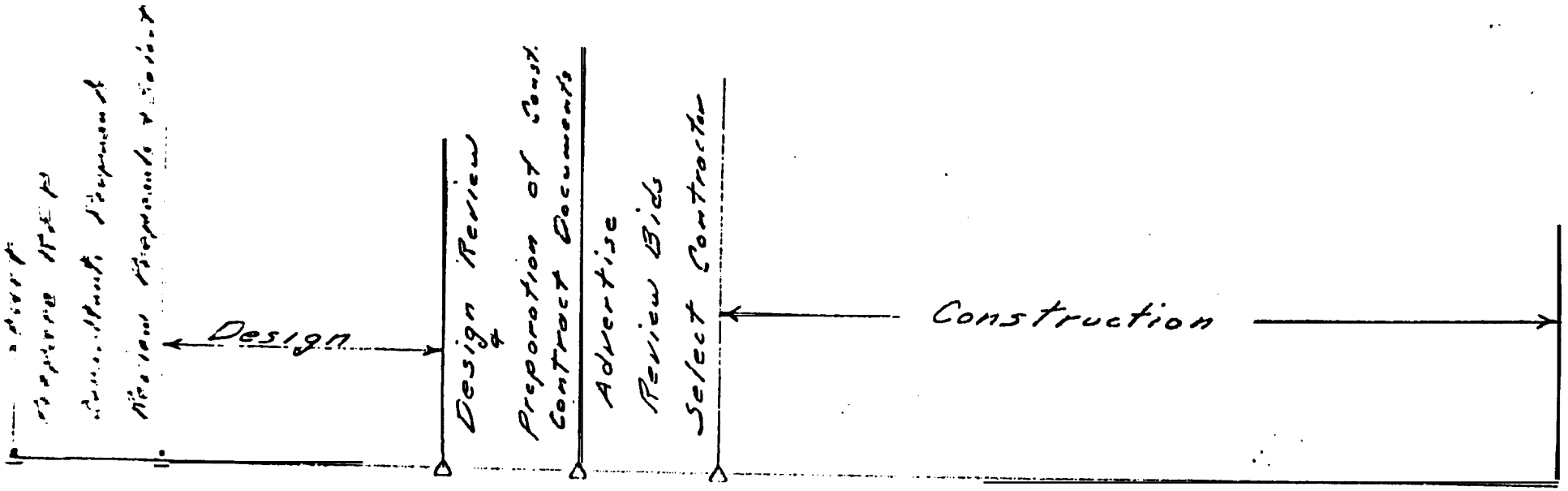
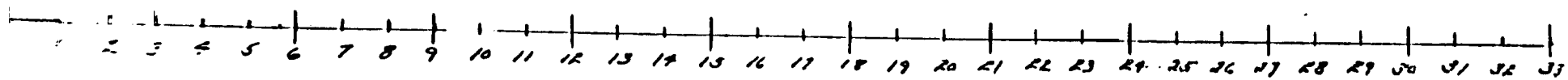
1958. Analysis of Creek Census Data for 1957. Seattle District, Corps of Engineers, 14 April 1958, 3 pp.

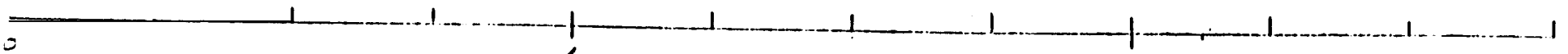
1959. Analysis of Creek Census Data for 1958 and Rèsumè of the Eight Year Study. Seattle District, Corps of Engineers. May 6, 1959. 12 pp.

Druel




Time in Months




Time in Years

Cabinet Gorge Hatchery

10/8.7